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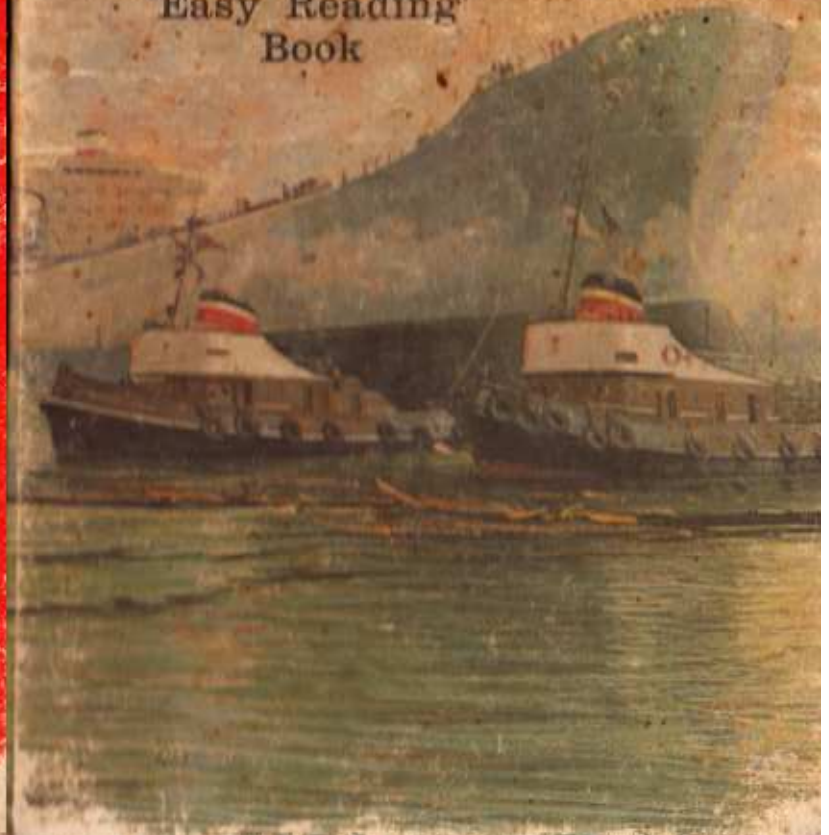
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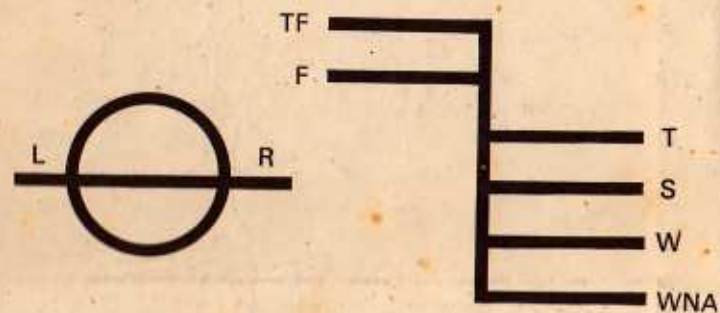
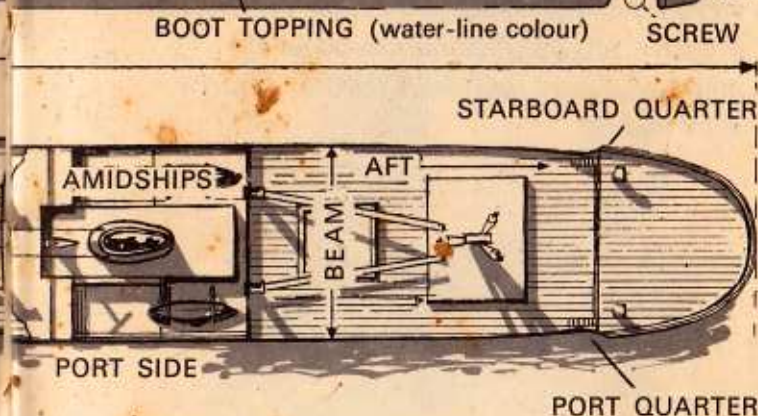
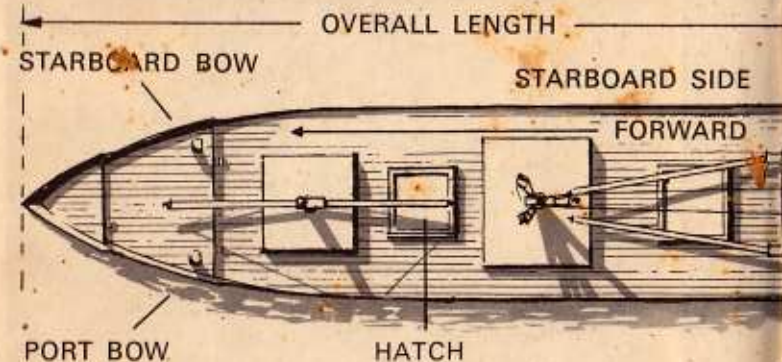
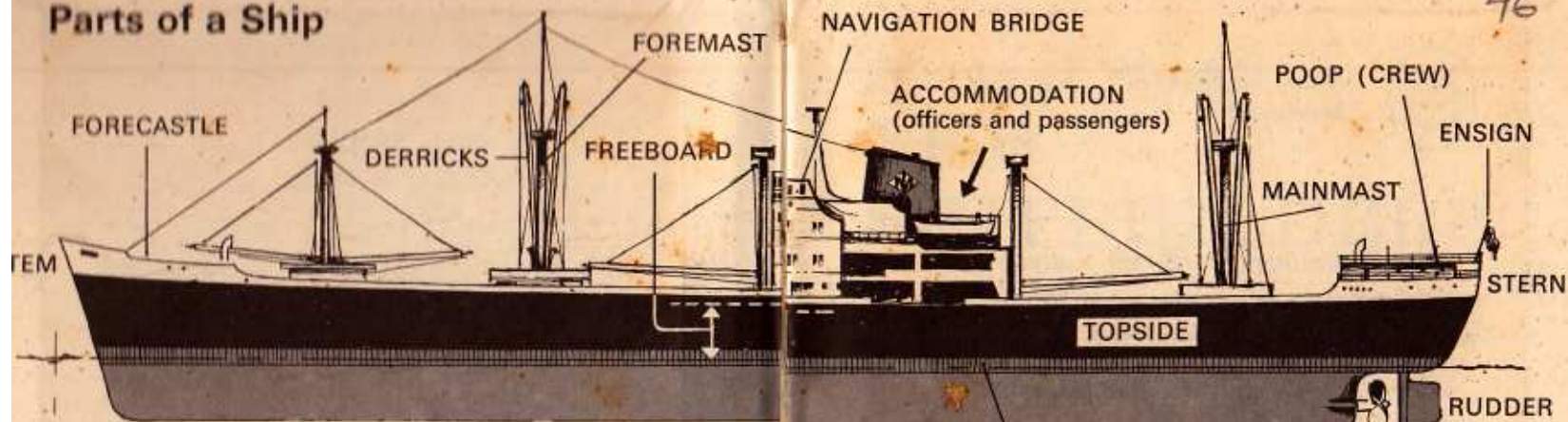
'People at Work'

THE SHIP BUILDERS

A Ladybird
'Easy Reading'
Book



Some Nautical Terms and Parts of a Ship



PLIMSOLL LOAD LINES

The Plimsoll load lines are marks painted on the sides of a merchant ship to show the safe depths to which she may be loaded.

TF = Tropical Fresh Water. F = Fresh Water. T = Tropical. S = Summer. W = Winter. WNA = Winter North Atlantic. LR = Lloyd's Register. This is a British society which exists to certify the seaworthiness of all merchant ships of one hundred tons or more.



A Ladybird Book
Series 606B

Here is another interesting Ladybird book which will help to answer many of the questions that lively children ask.

A relatively simple vocabulary, large clear type and superb full-colour illustrations are used to give information about the many processes and skills used in modern shipbuilding.

'People at Work' THE SHIPBUILDERS

by I. & J. HAVENHAND
with illustrations by
JOHN BERRY



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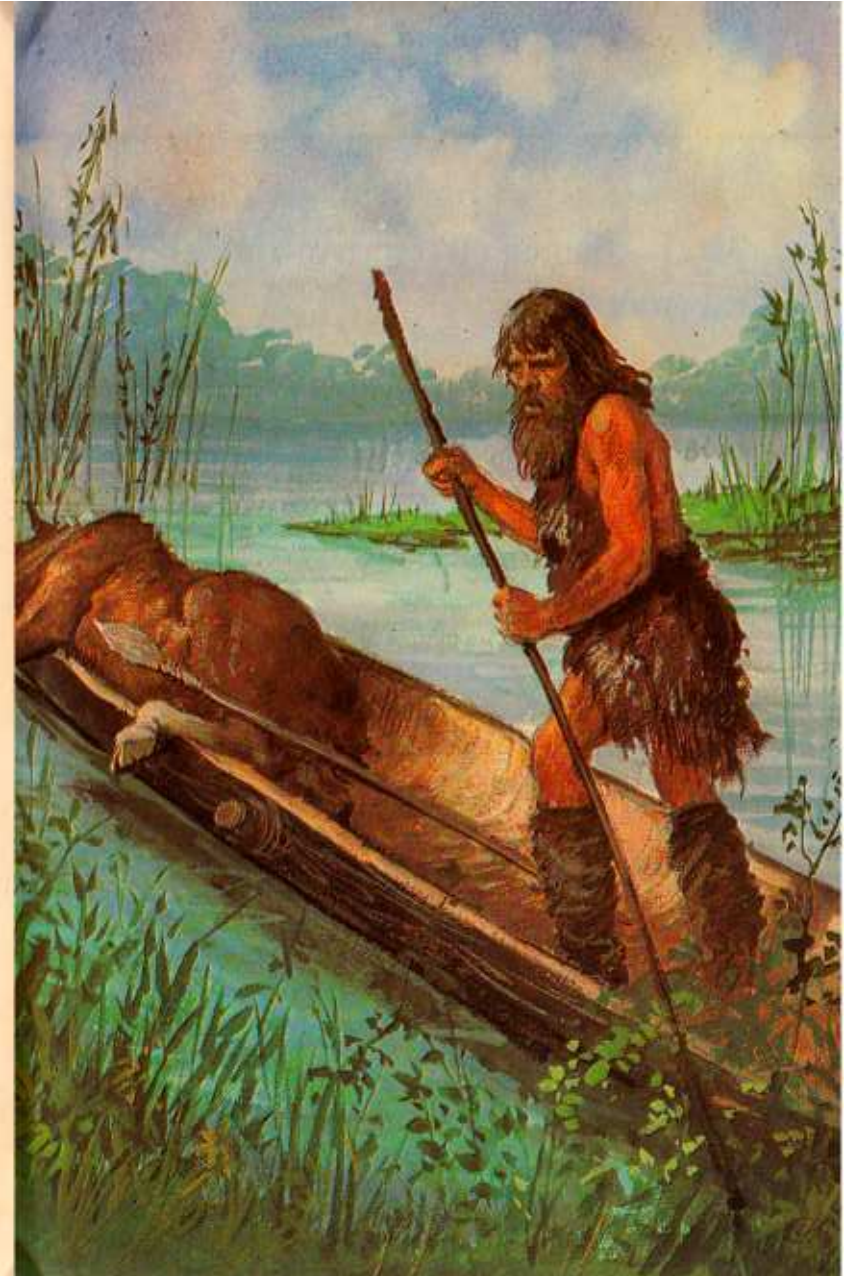
THE SHIPBUILDERS

The first ships were made from tree-trunks. They were called dug-out boats. Men hollowed out the tree-trunks with fire and stone tools.

Some men found another way to make boats. They made a frame of thin branches and covered it with skins. In our country these boats were called coracles.

As men made better tools they were able to cover a frame with planks of wood.

These early boats were moved through the water by men either using their hands as paddles or by using simple wooden paddles or poles.

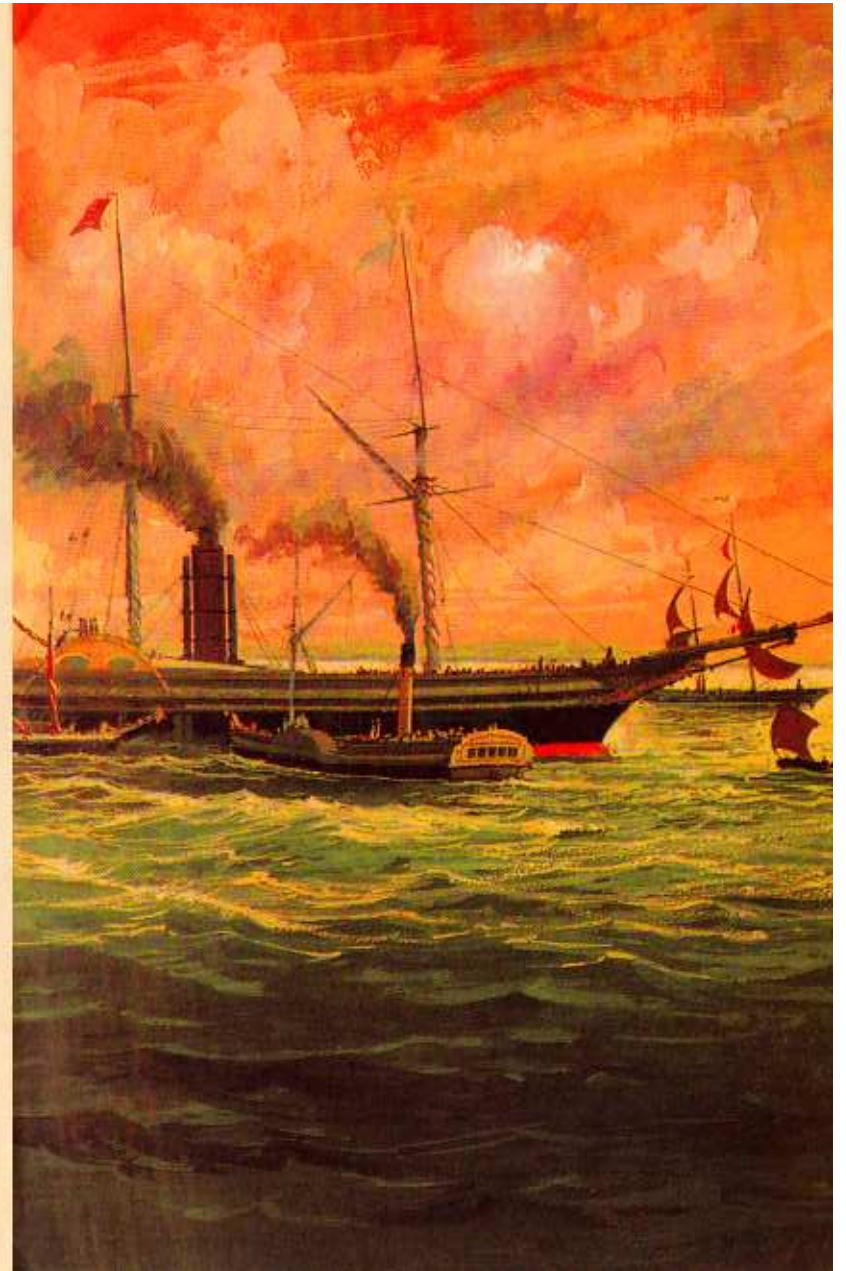


When bigger ships were made, sails were put on them so that the winds helped to move the ships through the water.

The best wood for making ships was oak and sometimes over one thousand oak trees were used for one ship.

In England there was not always enough oak, so iron brackets were used to save wood. Later, more iron was used and steam engines were put in ships to drive paddles or propellers.

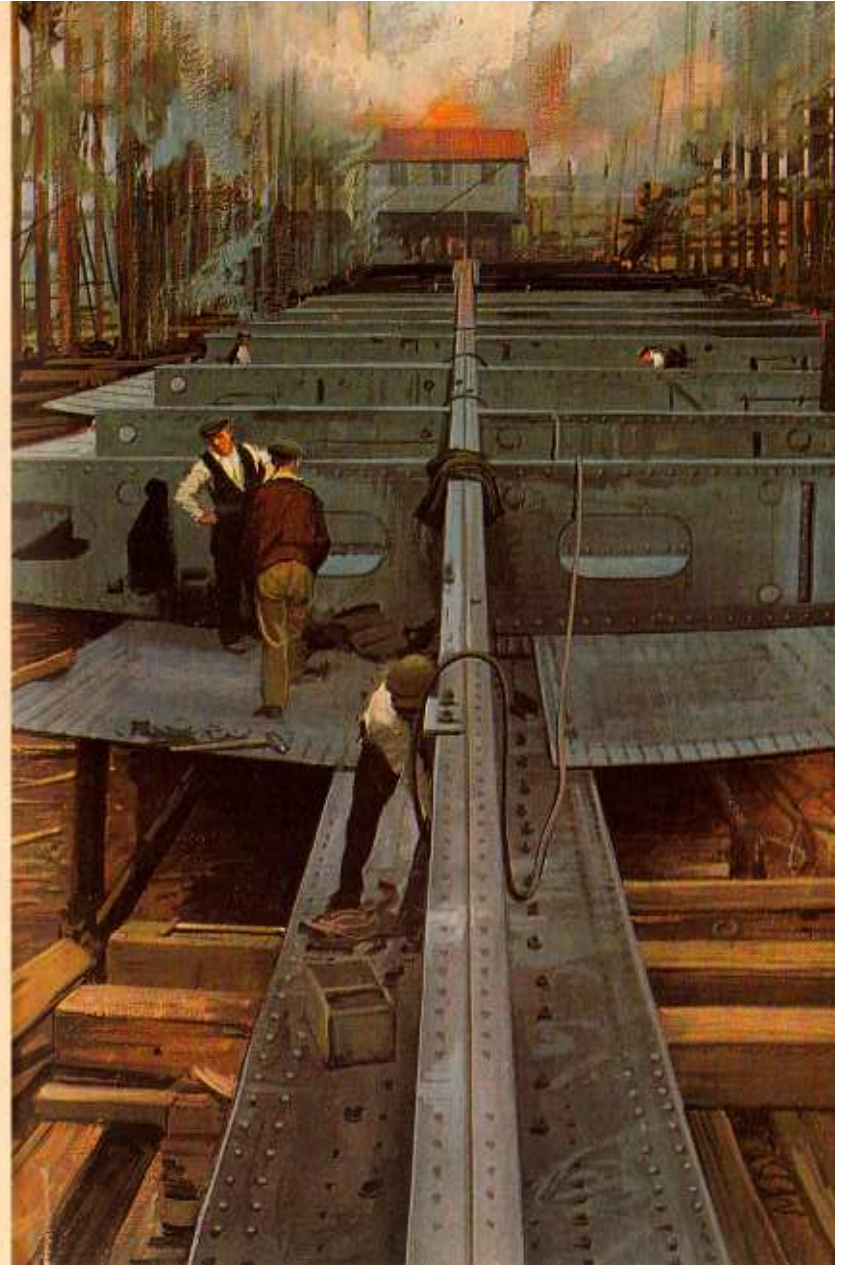
In 1839 a man called Brunel built the first iron ship. This ship was called 'The Great Britain'.



Today ships are made of steel.

Some ships are made by men laying the keel or bottom of the ship on a slope. The keel slopes gently to a river for launching. Large sections of the ship are made by men in other parts of the shipyard. These are lifted into place by cranes.

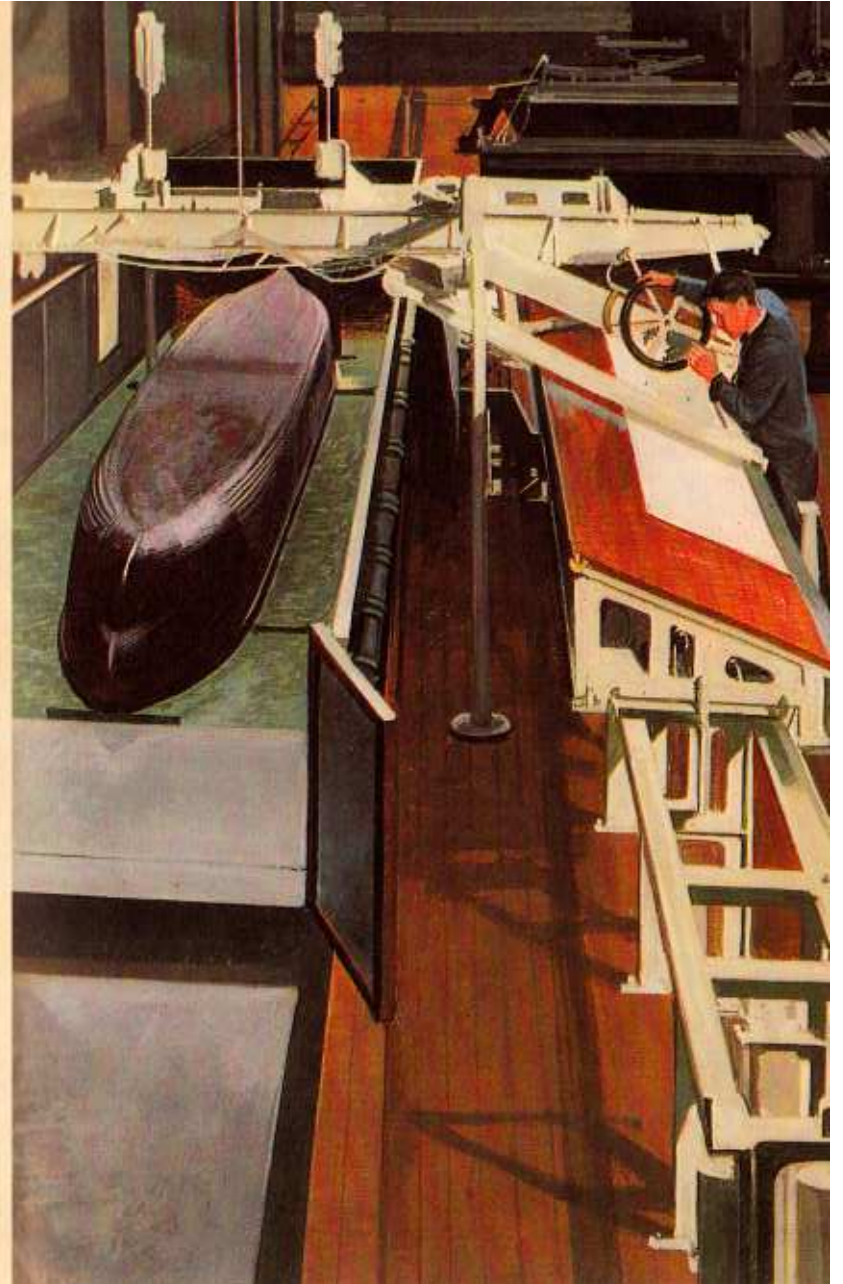
Very big ships may be built level, in a dry dock. This is a large hole lined with concrete with gates at one end to keep out the water. The gates are opened to let in water to float out the finished ship.



No ship is built unless it has been ordered.

When a shipping company wants a new ship, a few shipbuilding firms are asked to give a tender. The tender is the price which the builders think the ship will cost.

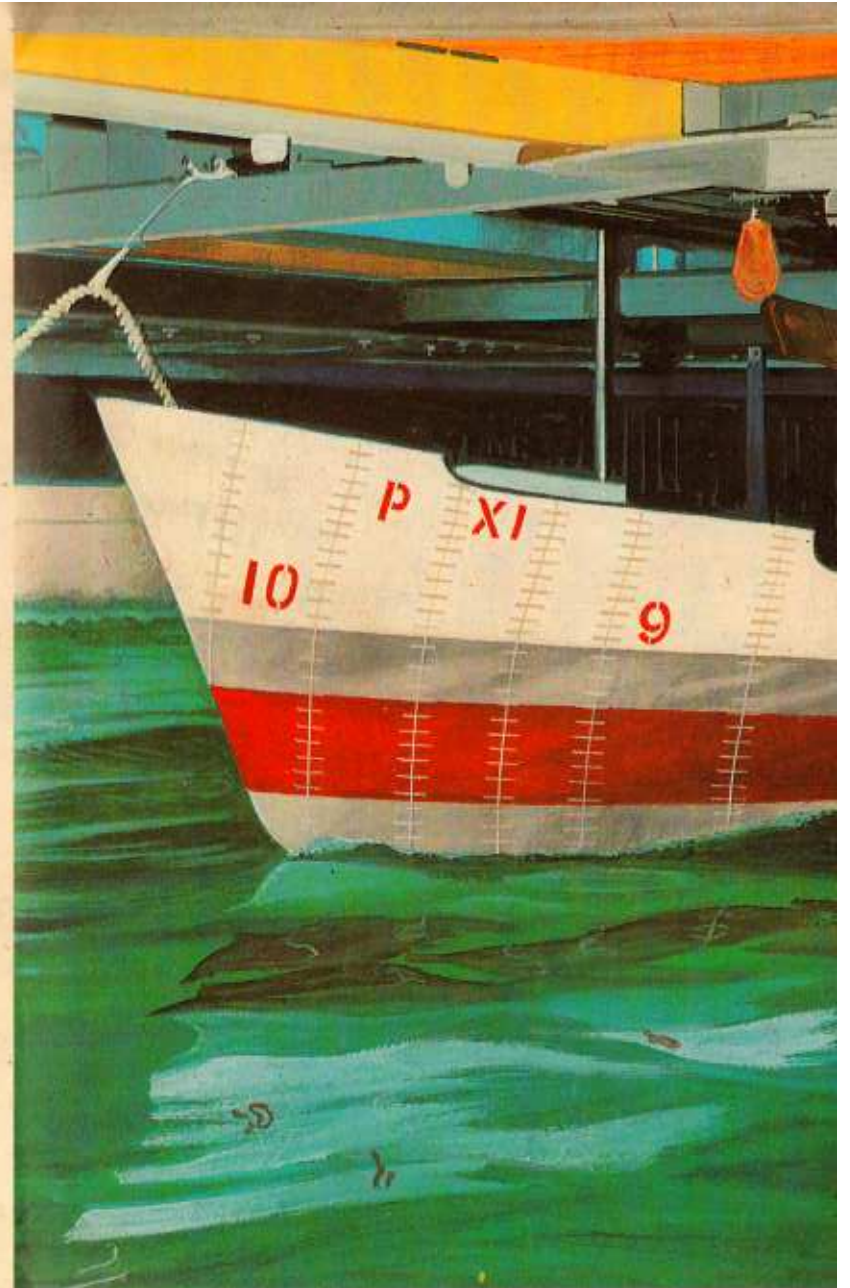
At the shipyard where the ship is to be built, plans are drawn. These plans are drawn by a naval architect and his men. The plans are taken to the shipping company where they may be changed. When the shipping company and the shipbuilders agree about the plans a test model of the ship is made.



Men at the National Physical Laboratory make the test model of the ship in wood or wax. The model may be twenty feet long and weigh four or five tons.

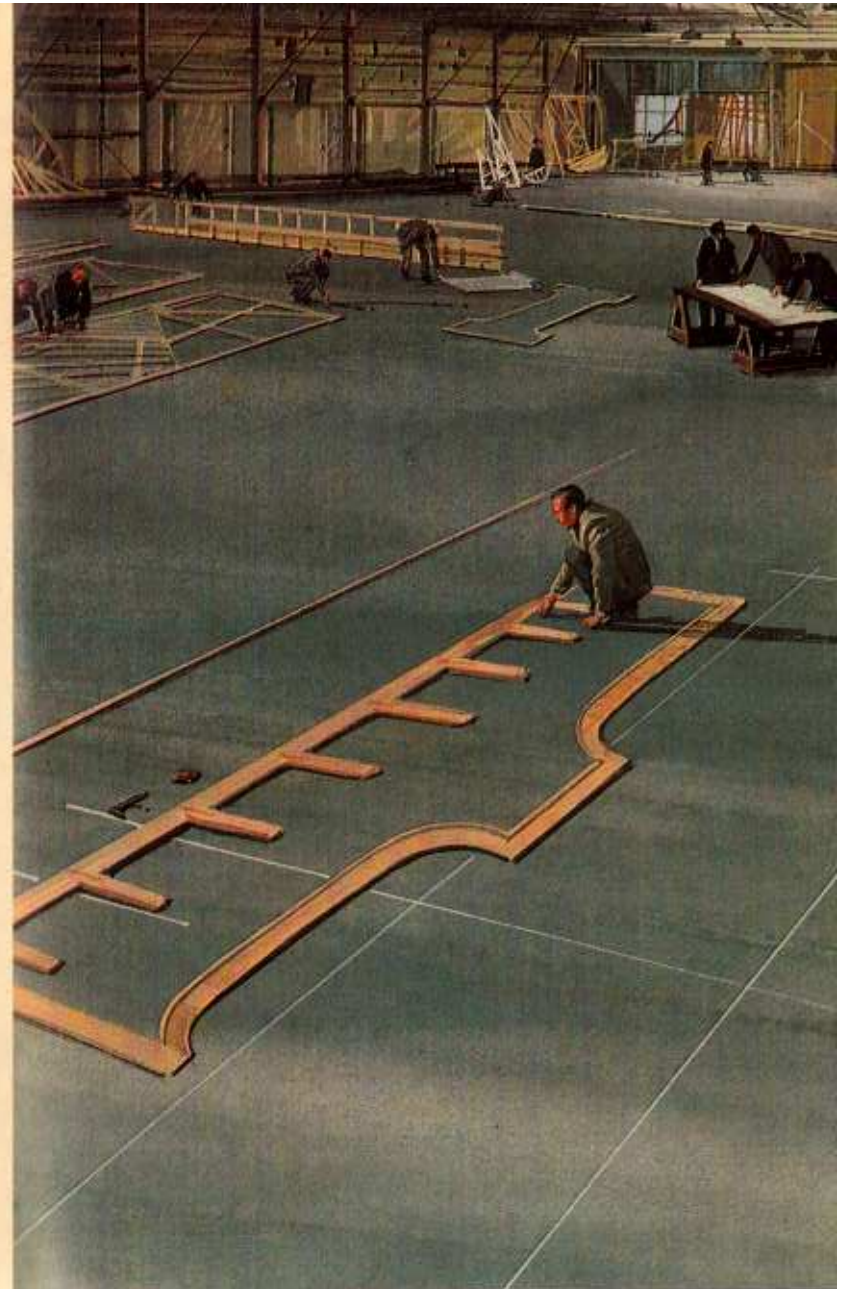
The model is tested in a tank which is almost a quarter of a mile long. Waves can be made in the tank.

In the tank the model is moved along and tests are made to find out if the ship will be seaworthy. Engines and propellers are fixed to the model to decide the best ones for the new ship.



When the testing of the model has been done, men at the shipyard make a full-sized drawing of the ship. This is done in a huge room called the mould loft. The floor is made of wood and is painted. On this the loftsmen use a knife to cut out the lines of the ship. The lines show up white on the dark floor.

The loftsmen then make patterns of the shapes of the steel plates needed to build the hull. These patterns are made of wood, paper or thin metal.



The patterns are taken to the plater's shop. There, men cut large steel plates into the shapes of the patterns.

Platers cut the plates to size by using either a shearing machine or a very hot flame.

On some machines a man puts a small plan of the plates needed on a glass screen. The machine is automatic and cuts two plates from the plan. One plate is for one side of the ship and the second plate is for the other.

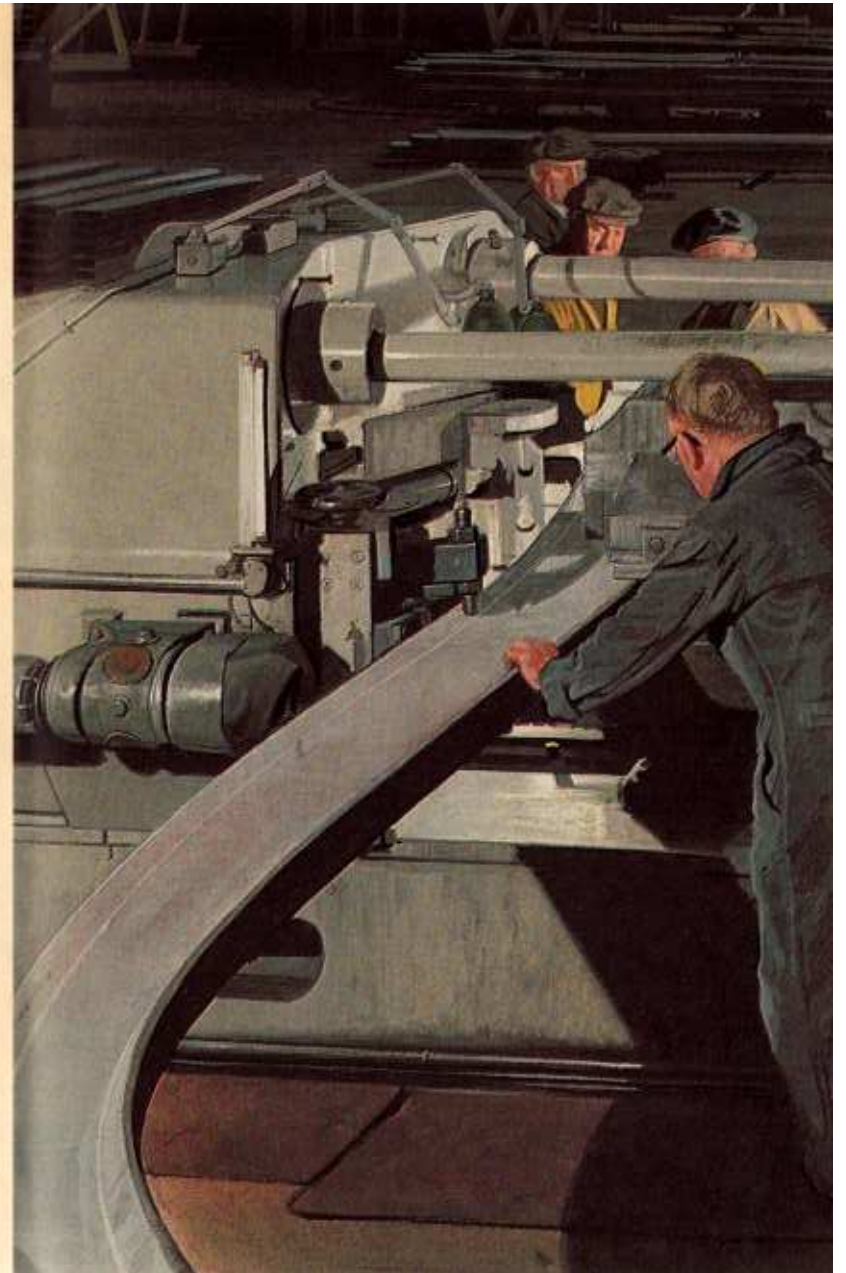
The steel plates are painted to stop them going rusty.



The steel plates for the hull of the ship are fitted on to a steel frame. The frame is made of thick steel by men called frame turners. The turners have to bend steel bars into different shapes.

Sometimes the bars are made red-hot before they are bent by the turners. They use long-handled hammers to bend the hot bars.

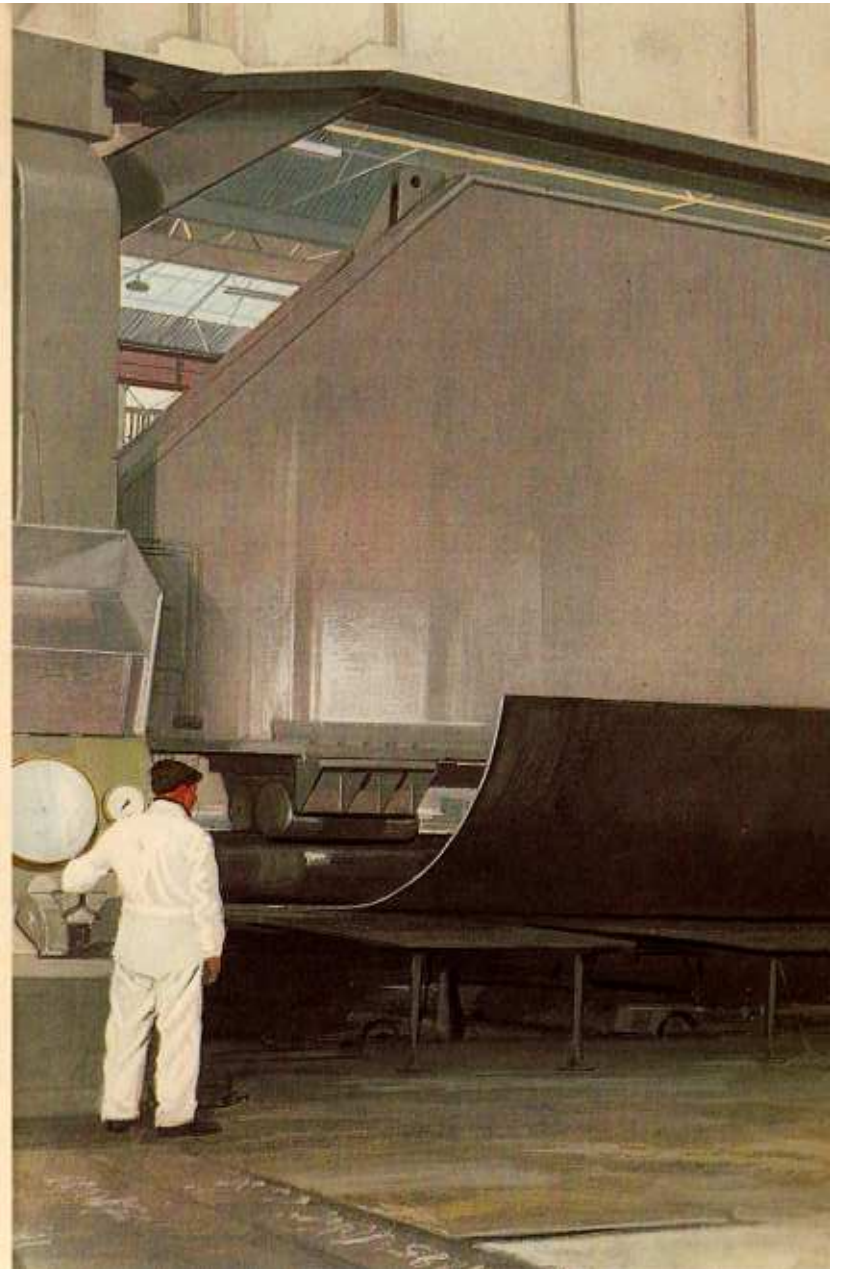
Many of the bars are bent cold. Large machines are used which can bend two bars at the same time. Cold bending is quicker and needs fewer men than hot bending.



All the plates and frame bars have to be joined together to make the hull of the ship watertight. The plates are bent on huge machines.

A few years ago the plates on most ships were riveted together. Each plate had holes along the edges. The plates were overlapped and men put pieces of metal, called rivets, in every hole. The rivets were put in hot and other men hammered the ends over.

Pneumatic hammers, which look like road drills, are now used to fix the rivets when riveted ships are being repaired.



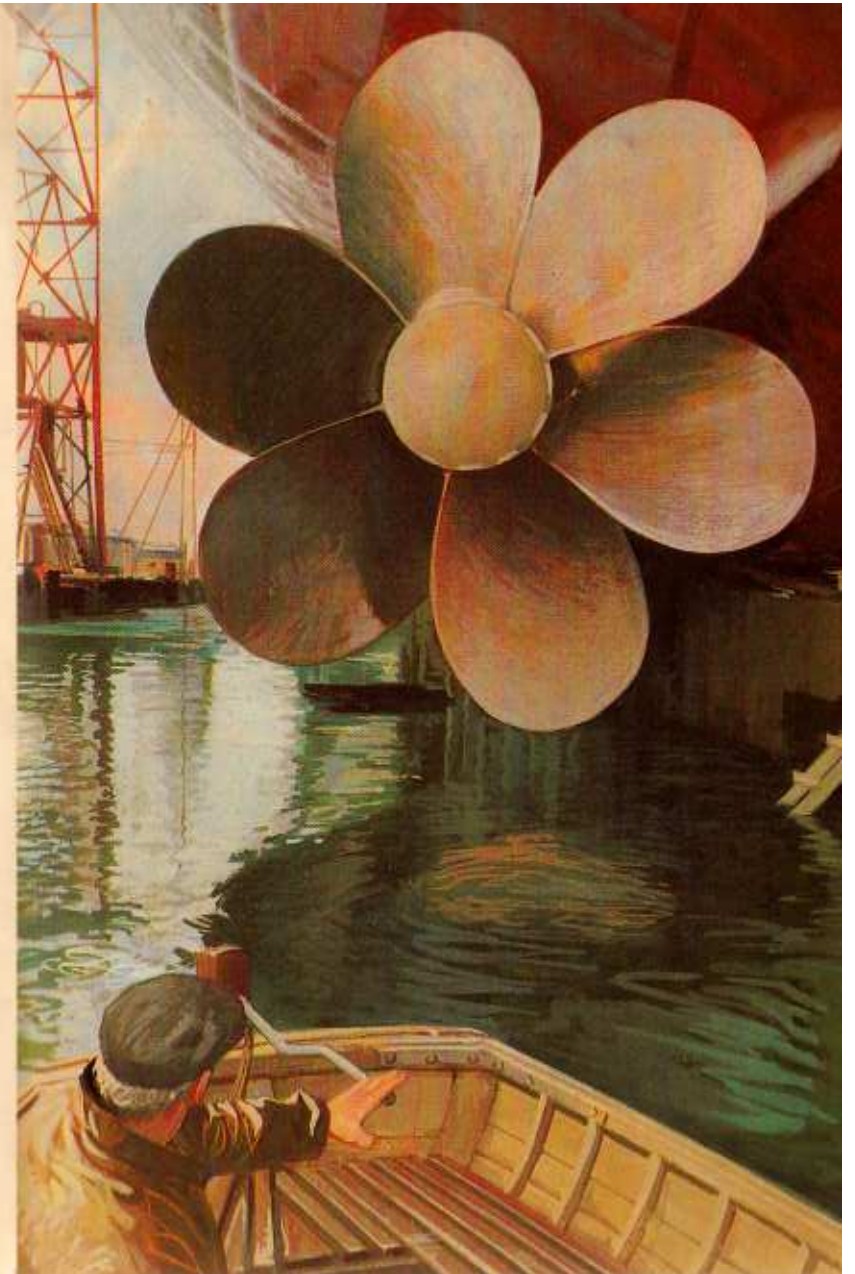
Today the plates on most ships are electrically welded together. One electric wire is fixed to the plate. The other wire leads to a strip of metal in the welding tool. The welders point the tool at the cracks between the plates. Hot sparks melt the metal strips and the welders run this metal into the cracks. When the metal cools the plates are joined together.

Less steel is used on welded ships as the plates do not overlap. This makes the ships lighter and cheaper.



When the stern of the ship is ready, the propeller and rudder are fitted. Men cut a large hole through the stern plates of the ship. They fix a tube from the hole to the engine room for the drive-shaft of the propeller to pass through. The propeller is fixed before the ship is launched.

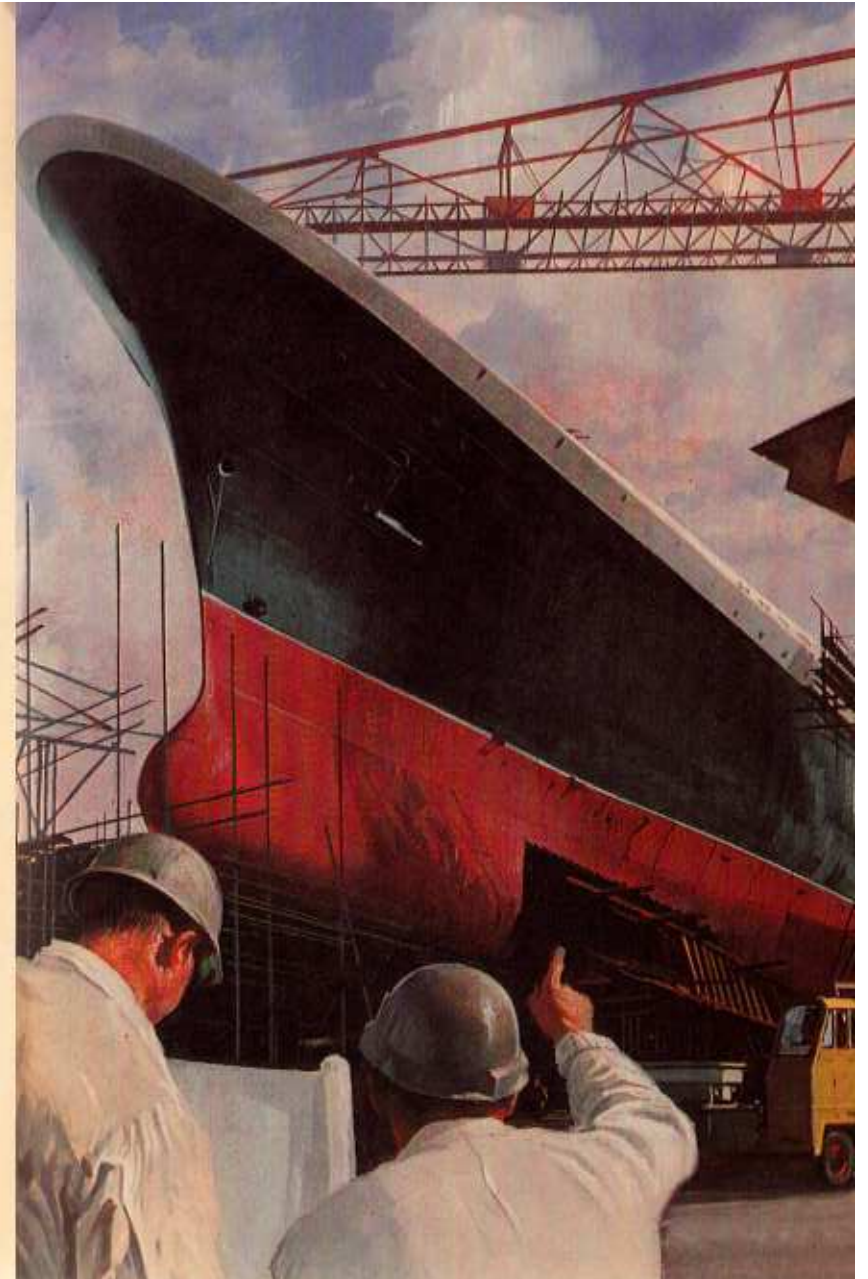
Some ships have more than one propeller and each may have four, five or six blades. The Queen Elizabeth II has two propellers. Each weighs over thirty tons and has six blades.



Smaller holes are cut for the rudder pins at the stern of the ship. Great care is taken to make sure that the rudder is absolutely upright.

While the ship is being built, the foreman shipwright checks to see that all parts are fitted properly. The ship must be built in a straight line from end to end.

As parts of the hull are added to the ship, men paint them with special paint to stop the steel going rusty.

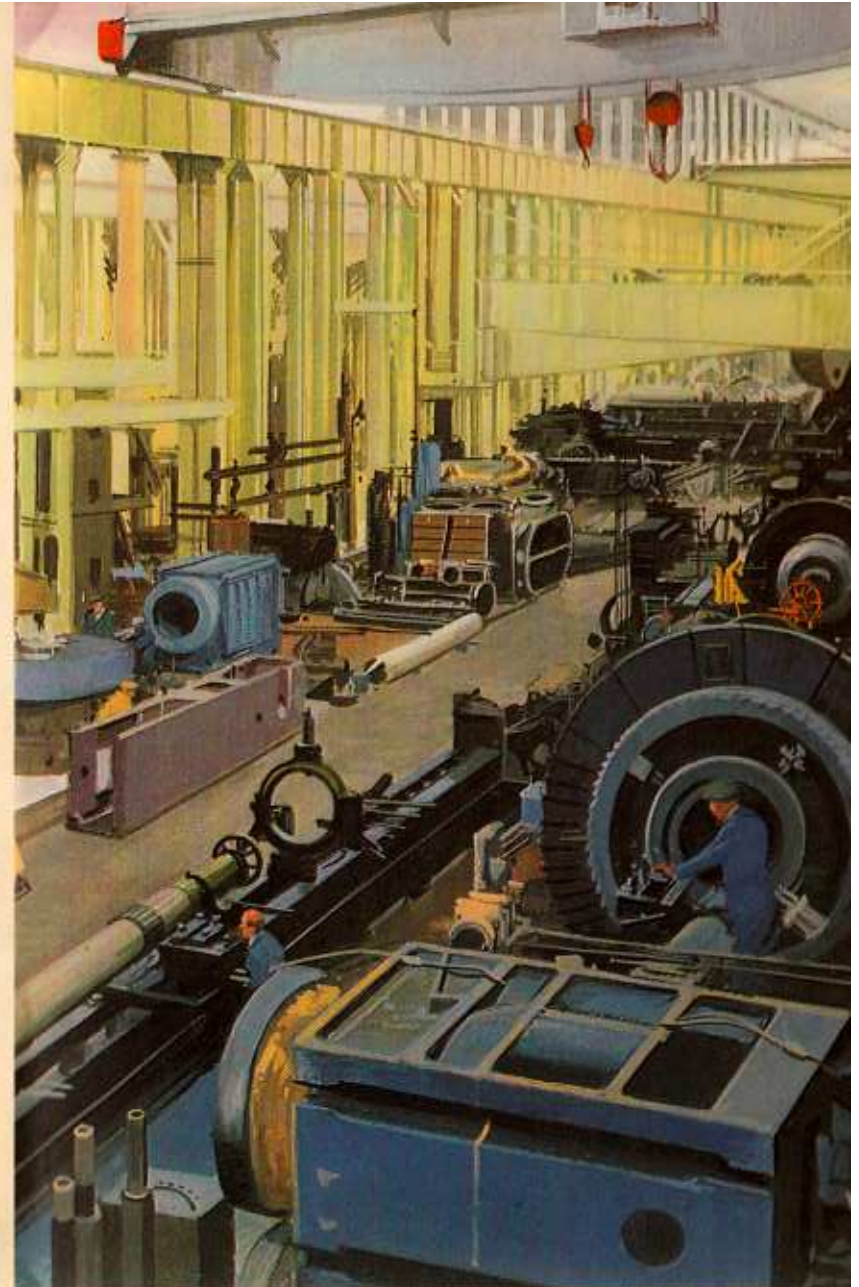


In another part of a big shipyard, men are busy making the marine engines that will drive the ship.

The engines are the most important parts of the ship. They must be reliable, powerful, not costly to run and not too heavy.

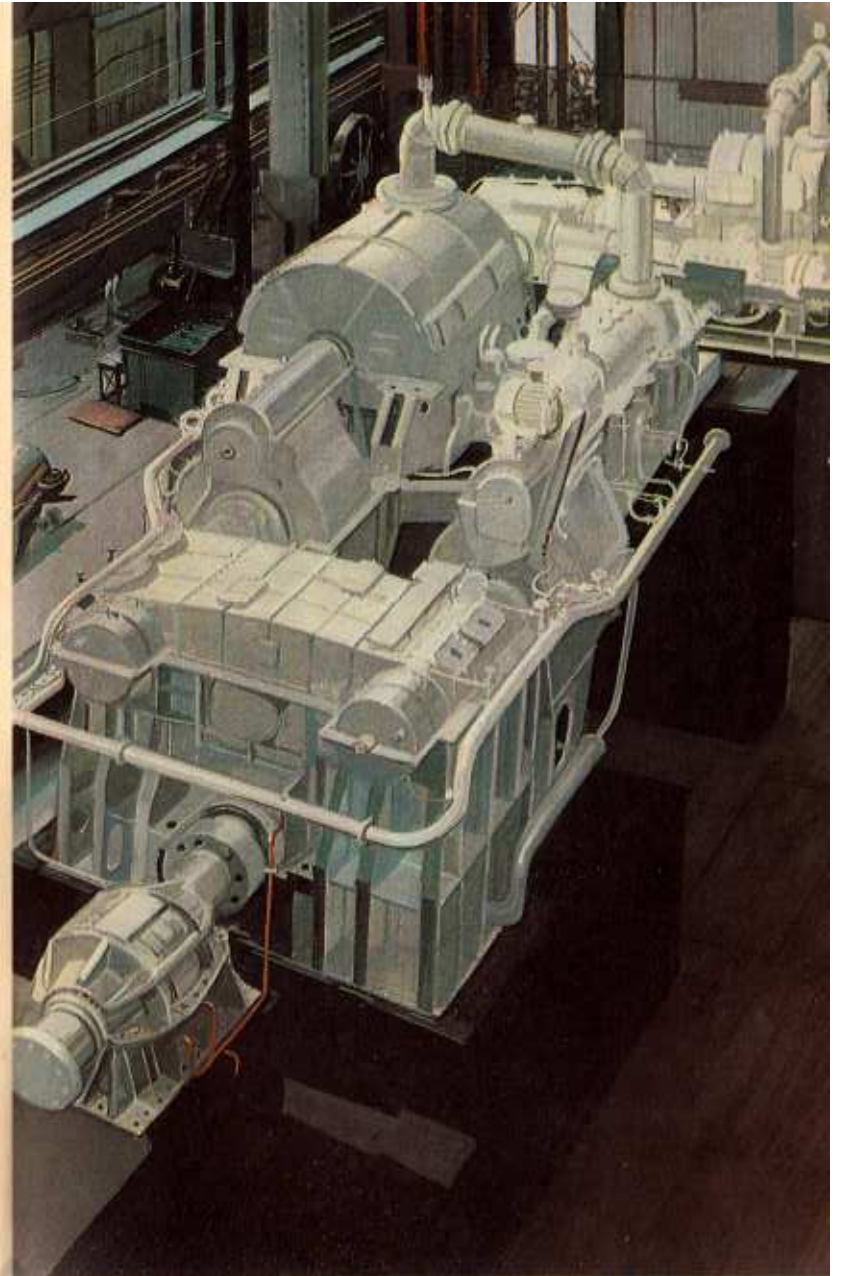
Engineers work out the best kind of engines for each ship. These may be large diesel engines, or steam turbines which burn oil to heat water in boilers to make steam, or turbo-electric engines. Turbo-electric engines use steam to make electricity to turn the propellers.

When they can be made more cheaply, nuclear or atomic powered engines will probably be used.



The engineers put together a ship's engines from hundreds of carefully made parts. They build the engines into large units in a workshop like the one in the picture.

When the engines are finished they are tested to see that they work properly. The finished engines are too large to be moved into the ship in one piece. They have to be dismantled into parts that can be moved. These are taken to the ship to be built up again in the engine room. The engines of many ships are not fitted until after the ship has been launched.

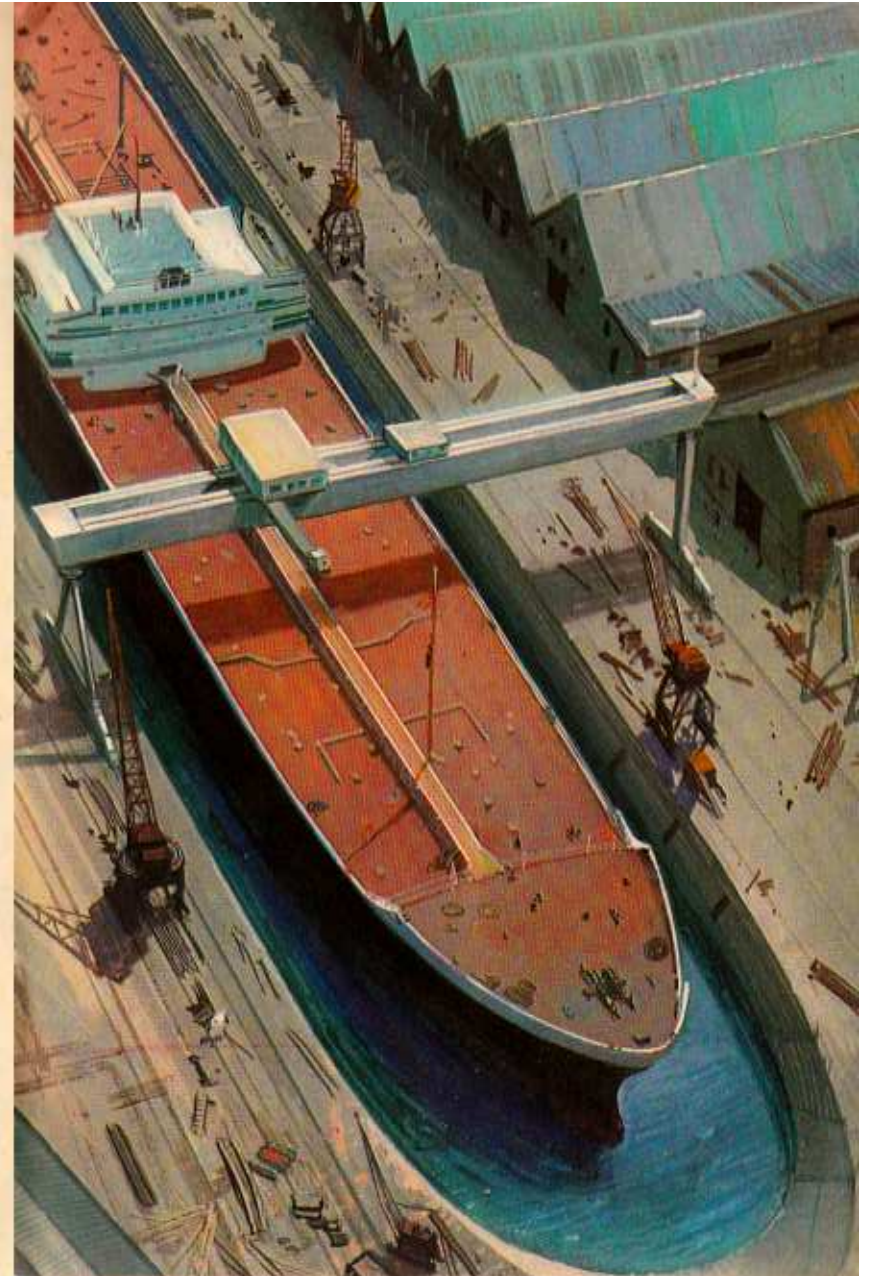


The date for launching the ship is decided upon even before the building begins, and ships built in dry berths like the one in the picture are easily floated by letting water into the berth (dock).

Most ships are launched down wooden tracks which are built under the ship. These lead down into the water.

A long wooden cradle is built under the hull, and this holds up the hull until it floats. The cradle slips along the launching track, which is covered with grease.

Large drag chains are fixed along the sides of the ship. These slow down the ship as it enters the water.



A few hours before launching, the shipwrights settle the ship on to the cradle by knocking out the keel blocks. The only things stopping the ship from moving are the drag chains and some special triggers on the launching way.

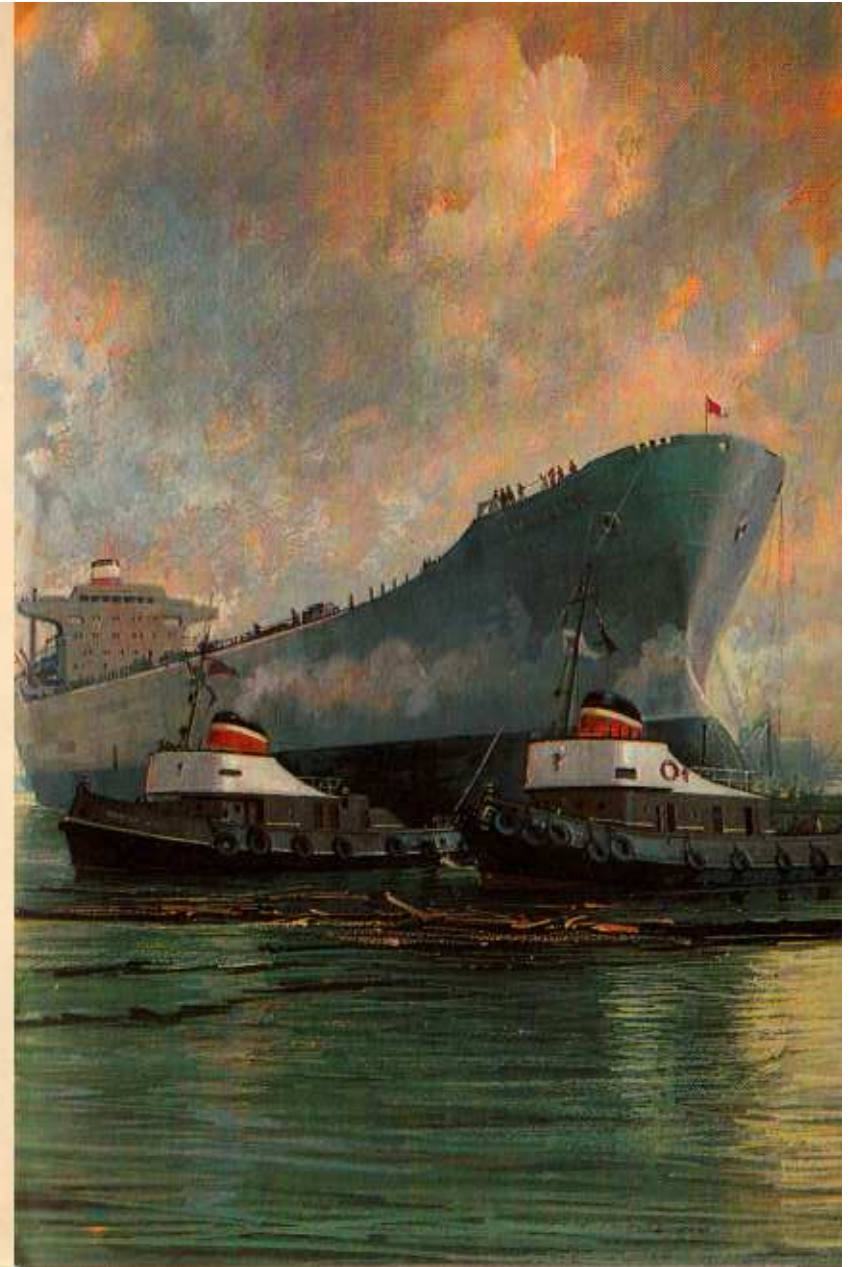
Usually a well-known lady is asked to launch and name the ship. This lady stands on a high platform near the bow of the ship. A bottle of champagne is broken against the bow and the lady names the ship. As she does this she presses a button which releases the triggers holding the ship.



The ship moves quickly into the water and is stopped by the drag chains. When she stops, tugs that have been waiting take up the tow lines to stop her drifting.

Men in other small boats drag away the cradle and collect up the wood that is left floating in the river.

The tugs tow the ship to the quay or basin where she will be finished. This is near to the building berth in the same shipyard. The finishing of the ship is called the fitting-out.



As soon as the ship is in the fitting-out basin, work begins again. Many men who have not worked on the ship before are ready to move on board.

On the dockside there are large store sheds packed with things that the men will need for the ship.

The main engines are among the first things to be fitted in the ship. Tall cranes move the large parts of the engines into the engine room. The engines are then joined to the propeller.



When the engines have been fitted, platers and welders finish off the decks.

The fitting-out of a large passenger ship like the Queen Elizabeth II may take as long as a year. Workmen divide the large spaces between decks into cabins and different rooms that the passengers and crew will use. Electricians and plumbers have to fix wires and pipes so that these are covered when the cabins are finished, like the one in the picture.

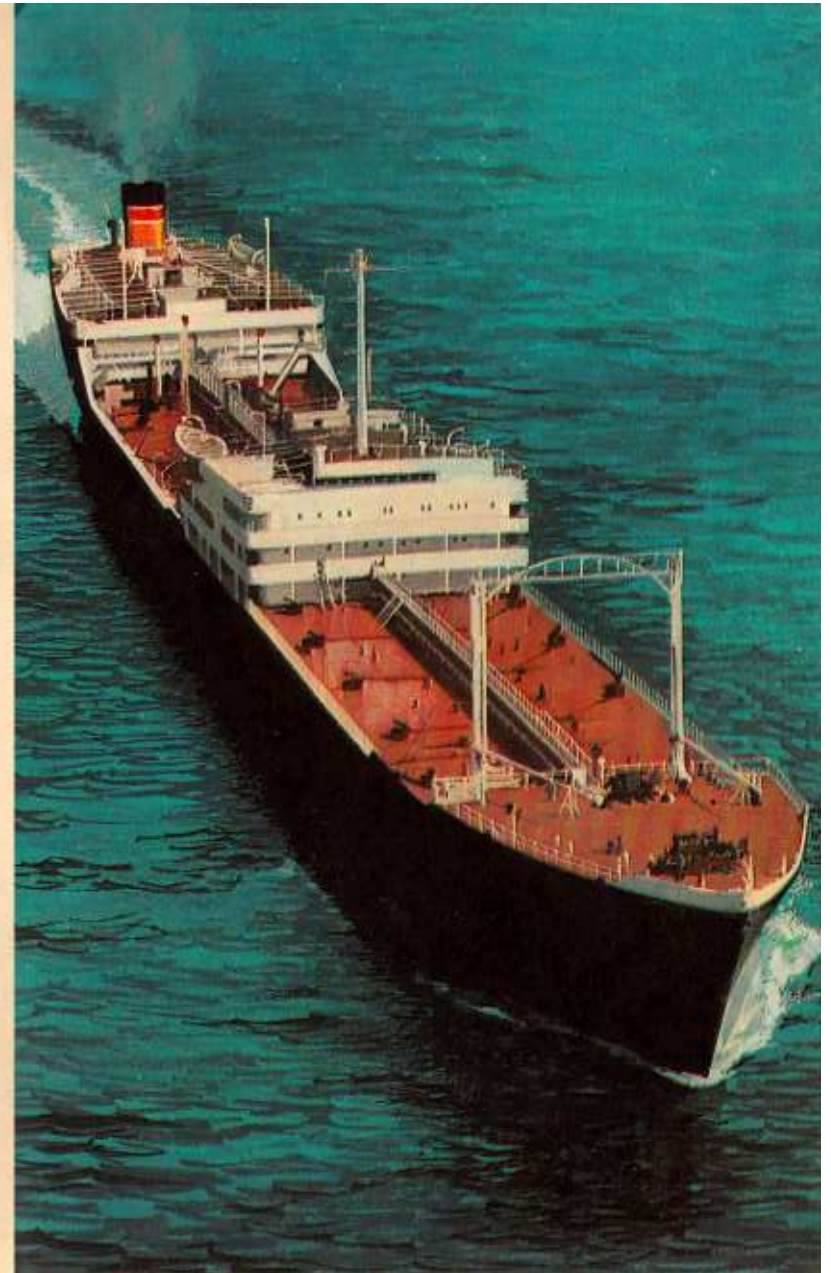
Nearly all the fittings that are used are fireproof as there are special safety rules for ships.



The fitting-out of every ship is different and depends on what the ship will carry.

Oil tankers are divided below the main deck into many large tanks. The engines and the living space for the crew are at the stern of the ship. Oil tankers are the largest ships that are made.

Large cargo ships do not take much fitting-out. The holds are made so that cargo can be loaded and unloaded quickly. If the ship is to carry meat, holds are fitted out as large refrigerators.



When the fitting-out is finished, the ship is ready to go on trials. These are tests to show the owners that the ship is in proper working order. Government inspectors on board see that the ship is safe and seaworthy. Medical supplies, warning lights and fire-fighting equipment are checked. Inspectors examine and test the lifeboats, like the one in the picture, and all the life-saving equipment.

Other inspectors from Lloyds watch the tests to see if the ship is fit to be put on their Register. Only the names of well-built ships are put on Lloyds Register.



During the trials, men put marks on the side of the ship to show how low down in the water she can be when loaded. This marking is called the Plimsoll line.

Some trials are carried out at sea along a mile of calm water. The steering gear and rudder are tested. The engines are tried at different speeds and a watch is kept on how much fuel is used. The engines are also run at full speed for several hours.

When the ship has finished her trials she is handed over to the owners.



At times ships have to be examined and worn parts have to be replaced. This work is usually done by ship-repairers and not by ship-builders. Sometimes the whole of the inside of a ship is refitted to make it more up to date.

If any repairs have to be made to rudders, propellers, or plates below the water-line, the ship must go into a dry dock. You can see an empty dry dock in the picture. The dock is filled with water and the ship floats in. Then the water is pumped out and the ship propped up with timber.



Naval architects, who design ships, are always trying to find cheaper ways of carrying goods by sea.

For some cargoes this can be done by making the ships bigger. Oil tankers will continue to be made larger and larger.

New cargo ships are being made, called container ships. In these the cargo is packed in metal containers like large boxes. These can be quickly loaded on and off the ships.

A different kind of ship now being made is the hovercraft, like the one in the picture. This rides over the water on a cushion of air that is blown down by its engines. It can carry thirty cars and two hundred passengers across the English Channel.



Some facts about the Queen Elizabeth 2 . . .



The QE2 is the biggest and most powerful twin-screw merchant ship afloat. She is 963 feet long and has a gross tonnage of 58,000. The engine power is 110,000 h.p. operating through two six-bladed propellers and the ship has a service speed of 28½ knots.

QE2 can accommodate 2,025 passengers and there is garage space for 80 cars. There are 13 decks, 2 indoor and 2 outdoor swimming pools. A computer system is installed which can be used to solve problems of navigation, supplies of food and water, accounts and a great many other things.